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Improved Channel Multiplier for Radiation-and-Particle Detectors

An improved channel multiplier has been developed for radiation-and-particle detectors. The multiplier amplifier detects X-rays, ultraviolet rays, and charged particles.

The multiplier as shown in Figure 1 is formed of glass. It includes a cylindrically-shaped main channel element having a length-to-diameter ratio of 50 to 1. The element has an open slot along its length. Attached to the slot edges are two glass plates set at an angle to each other. The plates are 12 cm long and have a maximum separation of 1 cm. This provides a 12-cm² detection area. The inside surfaces of the plates and of the main element are coated with a secondary electron emissive coating.

The main element also includes an aperture opening into a curved multiplier element. The curved element ends in a collector cap which collects multiplied secondary electrons. The curvature reduces any feedback of positive ions moving opposite to an electron stream.

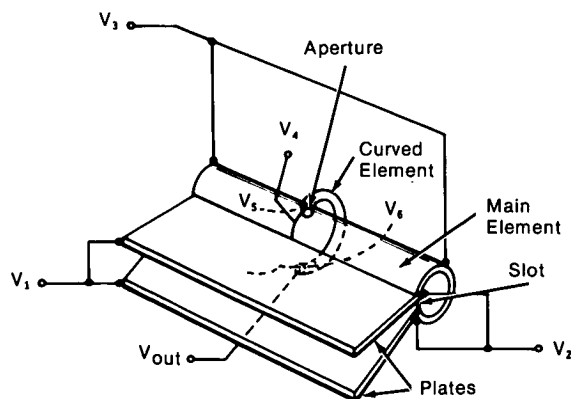


Figure 1 Multiplier Configuration

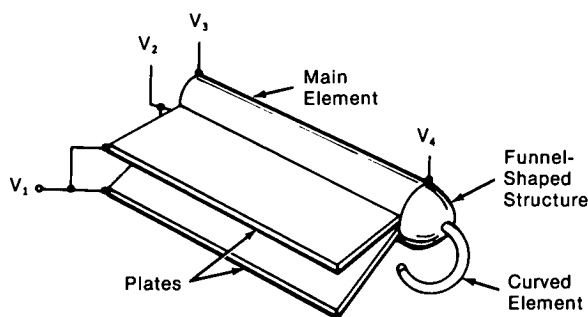


Figure 2. Multiplier Without Aperture

When radiation or charged particles strike the multiplier emissive coating, secondary electrons are generated. The electrons are guided between different voltage potentials to the collector cap. In this case, electrons are accelerated to the slot by the potential between voltages V_2 and V_1 , V_2 more positive than V_1 . The electrons passing through the slot strike its inside surface, generating an additional emission. The resulting emission is then accelerated between voltages V_4 and V_3 , V_4 being positive with respect to V_3 .

Once the electrons enter the curved element through the aperture, they are again accelerated between voltages V_6 and V_5 ; V_6 is positive compared to V_5 . Electrons striking the collector cap are then input to recording equipment.

A slightly modified design (see Figure 2) includes a funnel-shaped structure. The structure also includes a similar curved element. The voltage distribution is similar to that in Figure 1.

(continued overleaf)

Note:

Requests for further information may be directed to:

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Reference: TSP74-10275

Patent Status:

This invention has been patented by NASA (U.S. Patent No. 3,758,781). Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to:

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